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ABSTRACT

A study compared the academic achievement of two second grade samples (from a school in Westfield, New Jersey) learning a unit of science with two different instructional methods. The experimental sample of 19 students was taught a unit of science by a classroom teacher using the cooperative learning method, while the control sample of 19 students was taught the same unit in science by a classroom teacher using the Directed Reading Activity Approach. Comparison of the unit test scores indicated no significant difference in academic achievement between the two samples. One table of data is included and an appendix of data is attached. (Contains 15 references.) (Author/RS)

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A COMPARATIVE STUDY OF THE ACADEMIC ACHIEVEMENT OF PRIMARY STUDENTS WHEN LEARNING SCIENCE THROUGH THE DIRECTED READING ACTIVITY OR COOPERATIVE LEARNING APPROACH

by

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ABSTRACT

The purpose of the following study was to compare the academic achievement of two second grade samples learning a unit of science with two different instructional methods. The experimental sample was taught a unit of science by a classroom teacher using the cooperative learning method. While the control sample was taught the same unit in science by a classroom teacher using the Directed Reading Activity approach. It was hypothesized that there would be no significant difference in academic achievement between the two samples. Results were determined by comparing the unit test scores which were administered to both samples. No significant difference in academic achievement was found between the two samples.

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The ultimate goal when learning to read is to gain meaning from print and assimilate the new meaning with prior knowledge. In the primary grades, once readers have begun to respond to the objectives within a reading program and read more fluently, the classroom teacher usually teaches the student how to apply reading skills to the acquisition of information within the content areas. The teaching of science has gained much attention within the educational community because it, if carefully taught, provides many opportunities to develop critical thinking skills in children.

Since primary grade children are only beginning to understand how to use reading to learn, the teacher of elementary science needs to implement those programs which offer the most potential for academic success through attainment of understanding. Two methods which are currently used to teach science in the elementary grades are the Directed Reading Activity (DRA) and cooperative learning. Cooperative learning has become a popular method of teaching within the elementary school. Much literature has been published on teaching through cooperative learning. Workshops and seminars are held regularly to acquaint the classroom teacher with the cooperative learning approach. Administrators applaud its use within their districts and business encourages schools to teach students who will be future workers to learn to reach a specified goal

cooperatively.

The Directed Reading Activity is a more teacher guided approach and is, therefore, a more traditional method of teaching in the content areas. In addition, students work individually in this approach as opposed to the group efforts of cooperative learning. The question which arises is: does cooperative learning provide a more effective way of achieving academic success in the teaching of science to primary age children than the Directed Reading Activity?

Teachers are challenged with finding the most effective methods of preparing young students to interact with informational print in a way that stimulates academic achievement. New readers need to be taught how to apply their skills of word analysis, word identification, and comprehension to the content areas. Students in the primary grades are just beginning to expand their reading abilities and acquire new learning from reading. Science is one subject which contains a wealth of information for young readers to learn about and assimilate with prior knowledge.

One major difference between the cooperative learning method and the Directed Reading Activity is in their respective reward structures. Cooperative groups work toward reaching a group goal and receiving a group or individual reward. While in the DRA approach students work independently and receive a test score as their reward.

Slavin (1978) states that one of the most important

components of the instructional system is the reward structure. A reward structure is any method a teacher employs to motivate students to perform specified tasks. He also explains that with a traditional system of education the reward structure is usually competitive in nature.

Slavin (1983) classifies the incentive structure in the following way: cooperative incentive, competitive incentive, and individual incentive. In a cooperative incentive program a reward is received by two or more participants in a group performance. Individuals are dependent upon each other's performance within the group. A competitive incentive system is one in which two or more students are compared to each other and the best is rewarded. Oftentimes one's success requires another's failure. Within an individual incentive system the individual is rewarded on the basis of his/her performance. Dependence is on the self.

Different research studies report varying conclusions regarding the interaction of reward structures and performance. In Slavin's and Tanner's (1979) report on cooperative reward structures it is stated that Johnson and Johnson (1974) found that the cooperative reward structure increases performance outcomes in everything except tasks which are drill oriented. In this same report it is explained that Michaels (1977) found competition between individuals increases performance more than individual or cooperative reward structures. Slavin and Tanner (1979)

state that Miller and Hamblin (1963) found that individual and competitive rewards are effective only for individual tasks while cooperative rewards are effective for cooperative tasks.

In this same article Slavin concluded the following must be present for cooperative reward structures to be more effective than individual or competitive ones. Groups need to have sharing of important resources. They must work together for a good amount of time for group standards to develop and effect the group's performance. Individual accountability must be present in each group. Lastly, the only variable should be group productivity which is defined as quality or quantity of a group product. Group members' learning should never be a dependent variable.

In his 1978 article, Slavin reported certain research findings regarding cooperative learning. One study conducted in 1978 by Slavin and the other by Thomas in 1957 found that students were very encouraging of each other and developed strong norms to succeed as a group in cooperative teams. Equally important was the assertion that motivation for individual performance according to Slavin (1977) only occurs with individual accountability built into cooperative teams. Slavin continued to report in the aforementioned article that a study done by Lott and Lott in 1965 revealed that cooperative reward structures build interpersonal contacts and bonds which affect the group's performance. As Slavin

(1977) explained Johnson and Johnson (1972) found this to occur in their research and concluded that bonds develop because individuals are rewarded to the extent that they help others within the group.

On the other hand, Klesius, Searls, and Zielonka (1990) found that a number of studies concluded the direct instruction method of teaching as found in DRA was an effective strategy to use for developing higher-level reading comprehension skills.

Ryder (1991) noted that the direct instruction method of strategies such as DRA enables readers to experience a purpose for reading and the skill of interacting with text for comprehension reasons.

While Slavin, Madden, and Stevens (1989-1990) supported the idea that cooperative learning can be combined with other instructional elements in order to increase achievement of all students, it remains to be seen whether more achievement can be produced by one or the other strategy.

To explore such differences, if any, the following study was developed to test the hypothesis that there would be no significant difference in the academic achievement of primary grade students when learning science through the Directed Reading Activity or cooperative learning approach.

PROCEDURES

Two second grade classes in a suburban elementary school in Westfield, New Jersey were selected to participate in

this study. Samples were of equal size with nineteen children within each of the groups. Students were assigned to their section of second grade in the spring of 1992 by the principal who accepted recommendations from the first grade teachers regarding student placement designed to achieve heterogeneous grouping. Since I.Q. tests have not as yet been administered to either sample, there is no data to validate the balance of the classes according to academic ability. Students in both samples were of the same race and from white upper middle class families.

The researcher instructed the experimental sample in one unit of science using cooperative learning techniques. A second grade colleague of the researcher instructed the control sample using the Directed Reading Activity approach for the same unit in science. The teacher of the control sample has her master's degree in elementary education, while the teacher of the experimental sample is completing her master's program in basic skills. In order to limit the diversity of instruction to method alone, each instructor was given a syllabus of important facts and concepts to emphasize during the course of study for the science unit. The syllabus was used as an outline of what to teach. In addition, each sample group used the same textbook.

All lessons were taught three times per week for forty minutes. The teacher of the control sample taught the science unit using the Directed Reading Activity approach.

Students engaged in pre-reading activities of questioning, recalling, and thinking. Students were then instructed to read and find answers to teacher made questions. After reading, a discussion was held to elicit answers of these questions from students. Lastly, a follow-up activity was conducted to expand on concepts learned. This follow-up activity was either an experiment, art, or language activity.

Upon completion of each chapter and the unit, the students in the control sample were individually tested with the same test used for the experimental sample.

The experimental sample was engaged in cooperative learning activities for the study of the same unit in science. The class was divided into five groups of four students in each, with the exception of one group which had three students since there were 19 in the class. Groups were designed to resemble the STAD format of cooperative learning. Within each group were above average, average, and below average learners. Group names were voted on by members of each cooperative group.

Each lesson began with whole class teacher instruction. Instruction consisted of vocabulary work, brainstorming, webbing, filmstrips, and questioning. Following each fifteen minute introductory lesson, students met in their individual groups to do group work. Each group received a worksheet and was required to complete it within 15 minutes.

The format followed by each group was the same. Workers

with specific jobs performed within each group. All job assignments were modeled and practiced prior to the beginning of this experiment. The following jobs were selected by the researcher as age appropriate for primary grade students. A reader was to read all textbook pages and worksheet activities aloud to the group. The recorder was to solicit a response from each group member and record it on the worksheet. Since students were only in the second grade, worksheets were fill-in (from a word bank) or multiple choice. Once all students responded with an answer, the summarizer discussed the answers with the group and together they decided which answer they would accept as correct. The recorder would circle or fill-in that answer. The responsibility of the materials handler was to procure from and return to the teacher all materials needed for a particular lesson.

Support jobs were also held by members of each group. The reader was also the encourager of participation. Group members who were hesitant or unsure about a response received words of encouragement from this student. All recorders were also praisers. Praisers needed to express either verbal or physical praise, such as a thumbs-up sign or pat on the back, to all group members during the course of each lesson. Materials handler was also the checker for understanding. The checker needed to get feedback from group members to determine if all understood the lesson. Lastly, the

summarizer served as the noise monitor in order to keep discussions under control. All group members held two jobs apiece and were involved in responding to the questions in each lesson.

Upon completion of the worksheet for a lesson, all members initialed the recorder's paper to indicate acceptance of the answers and participation in the group's work. During the last ten minutes the entire class discussed the correct answers to the worksheets. Since all students actively participated in group work they were expected to be ready to respond to teacher questioning. The teacher would read a question aloud and randomly call on a student for the group's response. Recorders kept score for their group as the items were discussed. Each worksheet item was assigned a point value by the teacher. More difficult items were assigned bonus points. Upon completion of the whole class discussion all groups knew how many points their team had earned. The teacher reviewed the scoring of each worksheet and then placed the scores on a chart visible to all. Teams attained first place, second place, and so forth on the basis of their score for the day. Members discussed working to maintain a place or working to move ahead at the start of each new lesson.

When a day's lesson had been completed, group members were asked to quickly discuss their group work and evaluate their cooperativeness. A member of the group was called upon

by the teacher to respond by either giving a number from 1 to 5, with 5 being the highest, or by using a descriptor such as fair, good, very good, or excellent.

Some lessons were science activities in which groups worked to complete an experiment such as observing matter in soap bubbles, listening to sound travel through matter, and completing a circuit. The format remained the same; textbook reading of the experiment, worksheet to complete, and summary of answers. Points were earned for accuracy of worksheet completion.

When all the lessons in a chapter and the unit were completed, students participated in chapter and unit reviews. Each group worked to complete a worksheet with review questions. As soon as the class discussion was completed each student returned to his/her seat and completed a chapter or the unit test individually. Review worksheet scores were posted on the chart along with lesson scores. Individual test raw scores were totaled for each group and posted on the chart as one score for that group.

At the end of each chapter and the unit, group members were awarded certificates of recognition based on the total score for the group during that period of instruction. Special awards were distributed for each category. The group in first place received a Super Terrific Work in Science award, second place received a Terrific Work in Science award, third place a Great Work in Science award, fourth

place a Very Good Work in Science award and fifth place Good Work in Science award. All awards were formally presented by the teacher and were posted after the chapter and unit tests were administered.

Since one group had only three students the make-up of the groups changed after each chapter was completed in order to provide equity in group work.

The timing of the teaching and testing of each chapter and the unit was coordinated by the two teachers involved so that all work was conducted at the same time in the school year. This was done to eliminate the effects of outside factors which might have influenced learning. Activities such as classroom visitations, holiday preparations, and special programs, it was assumed, could alter the educational environment sufficiently and impede student concentration.

RESULTS

Upon completion of a unit of instruction in science, both the experimental and control samples were administered a test of content taught throughout this study. Table I illustrates the findings of this unit testing. In order to determine the significance between the two treatments, statistical tests were conducted on the raw scores of the test results. A t of -1.21 was computed indicating the difference between the means was not significant.

TABLE 1

Unit Test Results Comparing Cooperative Learning to DRA Approach

	Mean	Standard Deviation	t
Experimental	23.47	2.22	-1.21 NS
Control	24.21	1.44	

N = 19

DF = 36

CONCLUSIONS

At the outset of this experiment, the researcher hypothesized that there would be no significant difference in academic achievement when teaching primary science using the DRA or cooperative learning approach. The results of this comparative study give support to this hypothesis. Since no significant difference occurred between the mean test scores of .74 between the two samples, it would seem that the content was learned equally by the experimental and control samples using their respective approaches. Furthermore, a t of -1.21 indicated that any difference could have occurred by chance. The implication is that instruction in primary science with either method may produce learners of new content.

Since teacher differences and instructional method

seemed to have minimal impact on the results of this experiment, it would seem that both methods of instruction are viable options to use in the teaching of primary science. However, other factors involved in the instructional setting but not measured by testing need to be mentioned at this time. Individual on-task behavior, desire to learn, positive peer relationships, and self-esteem are all components of the cooperative learning method which impact on the instructional setting.

During the cooperative lessons, the researcher observed children actively involved in learning. Students were reading, listening, discussing, or performing tasks. Often groans were heard at the conclusion of a lesson and students expressed a desire to continue with the task. This type of on-task behavior resulted in lively discussions among group members. It was also observed that shy, quiet students began to express opinions and preferences within their cooperative group. These same students began to participate more regularly in whole class discussions outside of the science setting.

It was also observed that students began to ask the instructor many questions regarding the topic of study and were interested in collateral reading on the content under study. This desire to learn seemed to be an outgrowth of group involvement.

It was further noted that students who had previously

showed no inclination to work or play together were participating in group activities in a positive manner and were seen to play together during their lunch recess when they were free to choose any playmate. Students also displayed a willingness to participate in polite discourse and to acknowledge another student's contribution in a positive manner regardless of the subject area.

Prior to the cooperative unit of study, many students displayed a wariness in contributing answers or ideas. However, it was observed that these students began to take more verbal risks once the cooperative method was practiced on a regular basis.

There could have been other factors besides the cooperative approach which might have developed the above mentioned behaviors, however, certain components of the cooperative method seem to lend themselves to developing the student both cognitively and affectively.

To begin, each student is assigned two jobs to perform while participating in a group lesson. This encourages on-task behavior. Students are also accountable to each other and the teacher. Such accountability motivates students to actively participate. Lastly, a group's score and reward are linked to the activeness of each member. Students want their groups to do well and seem willing to do what is necessary to meet this goal.

It would seem that the desire to learn is also linked to

both the group reward and individual rewards. Students seem to internalize the concept that the group's success is dependent upon the contributions of each of its members. Group members displayed a keen awareness that daily work scores, review scores, experiment scores, and test scores were the factors which contributed to a group's standing within the whole class setting. Discussions about improving scores or maintaining scores were overheard by the researcher. It would seem that this desire to improve or stay ahead led to a desire to learn and achieve.

Since learners were continually interacting during this experiment the roles of praiser and encourager were important to keep a sense of acceptance flowing throughout the unit. Students were supposed to feel that all responses were appreciated even if not selected as the appropriate response for a particular item. It was noted by the researcher that students responded in a more accepting manner as the project progressed. The absence of negative criticism grew as the length of the project increased.

Due to the nature of cooperative lessons it was necessary for students to develop the ability to express responses and defend them with facts from the lesson. Participation in such an activity may well have led many students to develop their thinking skills as well as their verbal skills. Development of such abilities may explain the confident manner which was displayed by many students who had

previously demonstrated an unwillingness to participate in verbal exchanges.

Furthermore, these descriptive observations lend support to an experiment conducted by Slavin (1978) on Student Teams-Achievement Divisions. In this study Slavin concluded that using student teams and comparing students work with those of equal ability results in increased time on task, positive attitudes, desire to learn, and widened choices in selecting friends but did not produce any significant academic achievement over the control group.

Results of this current research suggest that the use of cooperative learning would be equally successful in achieving academic success as the DRA method in teaching primary science. However, if a teacher's objective is to develop students' time on-task, desire to learn, positive peer relationships, and self-esteem as well as academic gain then the cooperative method might be a responsible choice to make to reach this goal.

It should be noted at this time that the students who participated in this experiment had not participated in cooperative learning prior to this research. Since continued involvement in the experiment strengthened certain behaviors and skills, it is possible that with on-going participation in cooperative learning these same students may prove to be more academically successful in a particular area of study than students who are not proficient in cooperative

techniques. Hence, it is suggested that further testing might be conducted comparing students proficient in cooperative techniques with those who have little or no skill in these areas.

A COMPARATIVE STUDY OF THE ACADEMIC ACHIEVEMENT OF PRIMARY GRADE STUDENTS WHEN LEARNING SCIENCE THROUGH THE DIRECTED READING ACTIVITY OR COOPERATIVE LEARNING APPROACH: RELATED RESEARCH

As a result of his research findings, Slavin (1988) asserts that all cooperative groups are not equally effective in developing student achievement. He further explains that there are two conditions which are necessary for cooperative learning to succeed. The first is that each cooperative group must have a clear goal which each member should understand. The group may be working toward a certificate, free time, or bonus points. Secondly, each group member must learn the material. This is referred to as individual accountability which differs from the first condition of group accountability. One way to achieve this is to reward groups on the basis of the average of their members' individual quiz scores. Group goals explains Slavin (1988) give members a stake in one another's success and individual accountability ensures that all members are doing the work.

According to Hauserman's (1991) explanation of the Johnson and Johnson (1984) method of cooperative teams, five elements are necessary for academic achievement to occur. There must be positive interdependence; face to face interaction; individual accountability; interpersonal, small group skills and group processing; and group praise and reward.

Johnson and Johnson (1989) explain these five elements in the following manner. With positive interdependence students must realize that they are responsible for their own and their team members' learning. In face-to-face promotive

interaction students must be able to explain the material to each other and help each other complete and understand the work assigned. Through individual accountability students must be able to demonstrate mastery of the subject matter. By practicing interpersonal, small group skills and group processing students develop communication techniques, leadership abilities, connections with others, and resolution of conflicts. Finally, when using group processing skills students are encouraged to evaluate how they are working together and to describe how the group might improve its effectiveness in the future.

Johnson and Johnson (1986) found that if students are to learn more information, feel confident and motivated, and interact positively with each other then cooperative incentive structures are vital.

Students receive about 900 hours of instruction a year according to Slavin (1987). With this amount of instruction facing each student, Slavin (1987) believes it is unrealistic to presume that intrinsic interest and motivation will move students to work on a daily basis. Furthermore, he states that the extrinsic motivation of grades is less than ideal because feedback should be frequent and grades are given infrequently. In addition, grades are given in a competitive situation and poor school work may lead to continued failure and loss of self-esteem in regard to school work.

In this same report it was suggested that the critical

features of group contingencies, group rewards and individual accountability, be married with the critical features of cooperative learning methods, cooperative interaction, to ensure success of the cooperative motivation structure. It was further stated that research has proven that students achievement is enhanced when the above mentioned critical features are present within a cooperative learning method.

It would be expedient at this time to briefly explore some cooperative techniques. Slavin, Madden, and Stevens (1989) report two methods of cooperative learning which were designed to be the primary instructional tool for teaching reading, writing, and math. They are Team Assisted Individualization (TAI) and Cooperative Integrated Reading and Composition (CIRC). The principal features of TAI are teams, placement tests, curriculum materials, teaching groups, team study method, team scores and team recognition, and whole class units every three weeks. CIRC can be described in the following way: reading groups, teams (partner reading, writing, words read aloud, word meaning, story retelling, and spelling), basal related activities, partner checking, tests, direct instruction of reading comprehension, independent reading, integrated language arts and writing, and special education involvement.

Research on these two methods according to Slavin, Madden, and Stevens (1989) "clearly supports the idea that complex, comprehensive approaches that combine cooperative

learning with other instructional elements can be effective in increasing the achievement of all students in heterogeneous classes ... cooperative learning programs can be used as the primary instructional method in reading, writing and math - not just as an additional strategy to add to teachers' repertoires" (27). This thinking led to the conclusion by the aforementioned researchers that cooperative learning is an innovation which can also serve as a catalyst for curriculum and instructional changes.

In their article on Aronson's (1978) Jigsaw approach to cooperative learning, Anderson and Palmer (1988) indicated that teachers should design lessons so that students are motivated to work together to achieve both a common goal and academic success. In this way, they believe, students will grow both cognitively and affectively. The Jigsaw method which they describe can succeed in accomplishing the previously mentioned objectives.

In this method students meet in small heterogeneous teams to teach each other. Each member of a team is assigned a sub-topic of a main topic. Students from the various teams who share the same sub-topic meet to research and learn about the material. These researchers then return to their original groups to teach what they have learned to their team members. Students are motivated by the need to share ideas in order to achieve a group objective.

While Hauserman (1991) describes the TAI and Jigsaw

methods of cooperative learning he also explains three other approaches to the cooperative reward structure. Student Teams-Achievement Divisions (STAD) designed by Slavin (1978) begins with the teacher presenting a lesson. Student teams study by using worksheets. Answer sheets are provided for team corrections. Individual quizzes are administered following group work. Test results are the basis of team scores. A base score is determined by the teacher for each student and bonus points are given for achievement above the base score. Rewards are in the form of certificates or newsletters.

Hauserman (1991) describes Teams-Game-Tournament designed by Slavin (1978) as similar to STAD except students compete in tournaments rather than completing quizzes. Teams develop mastery by participating in regular practice. Top, middle, and low scorers receive points accordingly and individual scores are totaled to arrive at a team score. Rewards are the same as STAD.

Slavin and Sharan (1976) and Hertz-Lazarowitz (1980) developed the Group Investigation Method explained by Hauserman(1991). Group members choose sub-topics from a unit of study to investigate. Reports on these topics are prepared and presented to the class. All students are responsible for learning the material covered by each sub-topic. Individual tests may be administered or evaluations based on teacher observations of the investigative skills

used may replace testing.

Within cooperative groups students are usually assigned individual jobs. There are a number of jobs which can be used for this purpose. Therefore, the teacher must decide which jobs are important for the students to meet their group goal and should assign those jobs which are necessary to meet the objective. Johnson and Johnson (1987) describe jobs on two levels: functional and social. Functional jobs are those which allow the group to complete its work effectively. Four examples of functional jobs are reader, responsible for reading all group materials aloud; materials handler, secures group materials and returns them; recorder, writes all responses; and summarizer, reviews the group's answers with all members and determines if all are in agreement. While these are four common functional jobs they may be replaced by jobs which serve the group more effectively.

Social jobs are those which enable the group to work cooperatively by using interpersonal skills. Four jobs suggested by Johnson and Johnson (1987) are praiser, informs members of the group that they are doing well; encourager, prods members to try again or harder; noise monitor, controls the level of sound within the group; and time keeper, keeps members aware of the time left for the task. Social jobs may also be designed and assigned by the teacher as needed for the particular task.

An important role of the teacher during the cooperative

process according to Martens (1990) is to move among the groups to listen and to observe. If group members are not assuming their assigned jobs the teacher should assume the role for a while to model the correct behavior.

All cooperative learning does not involve worksheets or reports. King (1990) designed a cooperative strategy which integrated science and the language arts. Students were assigned to heterogeneous groups to study animals and to write and illustrate books using the material they learned in their cooperative groups as a basis for this project.

The points which the above mentioned researchers make are important to remember when a teacher begins to design the primary science program for the classroom. Jones and Steinbrink (1991) observed that in more traditional methods (such as DRA) reading a chapter of science is a prerequisite to participating in lessons. However, they further point out that such a prerequisite does not exist in cooperative learning because students include reading and language experiences as part of the actual participation. This action they believe makes it possible to teach the same amount of material in a shorter span of time. To them this is an effective way to teach science.

At this time it is necessary to describe the Directed Reading Activity. Klesius, Searls, and Zielonka (1990) define the DRA as consisting of five components which make it an "effective means of guiding students' reading in content

texts" (35). The first step involves vocabulary development with phonetic, structural, and lexical characteristics. This is followed by building of background and motivation in order to connect prior knowledge to new learning. Guided silent reading preceded by a purpose setting question is step three. In order to develop and determine comprehension the teacher questions as the students read during step four. Lastly, the teacher gives feedback by issuing praise and probing further.

In addition, Ryder (1991) explains that direct questioning is an effective way to teach students how to comprehend expository texts. He further believes that students' attention to the subject matter is greater when teachers present a question which give students a purpose for reading. It was further noted that the direct instruction method of strategies such as DRA enables readers to experience a purpose for reading that leads to the skill of interacting with text for comprehension reasons.

Similarly, Klesius, Searls, and Zielonka (1990) found that a number of studies concluded the direct instruction method of teaching as found in DRA was an effective strategy to use for developing higher-level reading comprehension skills.

However, Slavin and Tanner (1979) concluded that reading comprehension leading to learning was much higher in a cooperative reward structure than in an individual reward structure.

While, Slavin, Madden and Stevens (1989-1990) supported the idea that cooperative learning can be combined with other instructional elements in order to increase achievement of all students, it remains to be seen whether more achievement can be produced by one or the other strategy.

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APPENDIX

Raw Scores of Unit Test

Experimental Subjects	Score	Control Subjects	Score
1	24	1	25
2	22	2	24
3	23	3	19
4	25	4	25
5	25	5	25
6	25	6	25
7	25	7	24
8	25	8	24
9	25	9	25
10	25	10	25
11	25	11	24
12	17	12	24
13	24	13	23
14	25	14	23
15	23	15	25
16	22	16	25
17	24	17	25
18	23	18	25
19	19	19	25

*Unit test contained 25 questions.